



Gap in the Mastery of ICT Soft Skills for Vocational Graduate Workers in Industry: Case Study of LPP Polytechnic

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ABSTRACT

The COVID-19 pandemic has been forcing a global shift toward technical and inventive skills to increase job readiness and productivity. Vocational graduates must be able to respond competitively by acquiring added value through soft skills. This can help them to compete in the domestic and global job market. These skills are now required for professional acceptance. This study aims to investigate the role of soft skills in learning and using information technology, the internet, and computers in order to increase individual and organizational efficiency, especially for vocational graduates. The data in this study were obtained through online surveys on vocational graduates from LPP Polytechnic and comprehensive interviews with educational institutions, government agencies, industry representatives, and LPP Polytechnic graduates. The statistical results show that there is no significant difference of the graduates' technological mastery between the time of their graduation and after employment. It is also revealed that many vocational graduates have learned to use soft skills to improve their professional competitiveness and technical abilities. ICT skills increase the employability of vocational human resources so that they are more capable of competing with undergraduate human resources.

I. INTRODUCTION

Changes in the global economy following the trend of Industry 4.0 due to the impact of COVID-19 pandemic changed the direction of industrial development and, of course, the

direction of human resource (HR) development. Vocational human resources have become highly sought workforces because of the changing needs of the industrial world. Schwab and Zahidi (2020) stated that global changes in the workplaces in terms of direction and transition due to Industry 4.0 and the COVID-19 pandemic necessitated the management of human resources to be more

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adaptive, namely it required them to possess better competencies. Indonesia is also impacted by the global changes, which means development efforts aiming to generate the competent human resources that relevant to the current business and industrial world is highly necessary (Zulfiyandi et al., 2021).

The 2020 Global Competitiveness Report stated that the global unemployment is attributed to the global economic crisis due to the impact of COVID-19 pandemic (Schwab & Zahidi, 2020). In this regard, Indonesia and the UN are collaborating with multi-sector parties to strengthen partnerships in building a prosperous nation, overcoming the impact of COVID-19 pandemic, and working towards a sustainable, resilient, and inclusive recovery condition (United Nations, 2023).

The image of the Indonesian labor market was explained by Zulfiyandi et al. (2021), which stated that the number of people aged 15–24 years old in Indonesia in February 2021 were 44.09 million, or around 21.47% of the total working-age population. There were 9.82 million young people (22.26%) who were not working, attending school, or training. There were 5.33 million people in cities and 4.48 million in rural areas. In February 2021, the number of unemployed individuals in Indonesia remained at 1.52 million, which represents 17.43% of the population. The total youth workforces in February 2021 were 21.2 million people or around 15.16% of the total workforces in Indonesia. Meanwhile, the participation rate of the young workforces in Indonesia is known to have reached 48.07%. There were 17.37 million young working people, or around 13.26% of the total working population in Indonesia. Meanwhile, there were 3.82 million young people with open unemployment, or around 43.70% of the total open unemployment in Indonesia. In August 2020, the Total Population Unemployment Rate (TPT) was 8.98% in urban areas and 4.71% in rural areas, with an overall average of 7.07% across Indonesia. TPT based on gender differences was 7.46% (men) and 6.46% (women). The three provinces with the highest TPT were DKI Jakarta (10.95%), Banten (10.64%), and West Java (10.46%). The three provinces with the lowest TPT were West

Sulawesi (3.32%), Central Sulawesi (3.77%), and Bengkulu (4.07%) (Sakernas, 2020).

Central Bureau of Statistics (2023) states that the workforce consists of people within the working-age population (15 years and over) who work or have a job but are temporarily unemployed. Vocational human resources from diploma 3 and 4 degree are the essential part of the educated and professional workforces. In practice, the diploma 3 and 4 vocational human resources, through their acquired competencies, should be able to compete with bachelor's degree students because of their advantages in acquiring work skills, thus they are supposedly better prepared to work. This is because diploma 3 and 4 vocational human resources are prepared to be immediately ready to work and possess basic knowledge and skills to handle direct work practice. According to the Central Bureau of Statistics (2023) work is defined as a state of continuously repeated operations for a certain period of time with aim to generate income or profit. Unpaid family workers are included in the working population group, while an employee in a company requires many skills. However, nowadays, knowledge or skills concerning information technology are an absolute thing to be acquired.

Currently, digital technologies provide opportunities for those who possess the adequate level of ICT skills demanded by the labor market. However, they limit the options for those who do not possess these skills or have failed to upgrade them accordingly (Pichler & Stehrer, 2021). Moreover, the world is moving towards Industry 4.0, which heavily uses ICT, especially networking technologies, to support industrial operations (Setiawan & Poerbosisworo, 2022).

Previous studies, such as Bolaños and Pilerot's (2023), stated that digital capability in vocational human resources is a set of skills that has been required by the industry and occasionally does not conform to the context of work, thwarting the other potentials of vocational human resources. Avis (2018) suggested that human resources need to have the ability and mastery of technological developments as a respond to the global changes following the trends of Industry 4.0, which requires these competencies. In ad-

dition, as this ability has become a globalized criterion from the industrial world to increase business performance and productivity, the government needs to regulate policies on HR management to improve technological development competencies in order to provide socially fair opportunities. The ability and mastery of information and communication technology are the skills and knowledge that need to be integrated into the other work abilities by human resources (Brown & Duguid, 2017). Likewise, Anderson (2008) explained that the ability and mastery of technological development are competencies that need to be sought and built in the education world. This capability needs to be appropriately developed in order to meet the current needs of the global industry.

Competency, according to Spencer and Spencer (1993), is an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or situation. They also mentioned that competence is the ability of individuals to perform work in the form of physical and mental activities (at the level of action behavior). Competence consists of two types of skill, namely hard skills and soft skills. Hard skills are specific technical abilities or solid factual knowledge required to do a job. These skills can be referred to as the ability to do something based on “what you know” (Hunt, 2007).

Meanwhile, soft skills comprise interpersonal, human, or behavioral skills necessary for applying technical abilities and knowledge in the workplace (Rainsbury et al., 2002). Based on the interview results with resource persons from companies, soft skills are very important in the workplaces. It was even stated that hard skills can still be learned, but soft skills take a long time to acquire. As a result, job applicants with strong soft skills have a better chance of getting hired and staying on the job.

It is interesting to investigate which of the two skills is mostly needed for companies that will use the workforces generated by vocational training. This is because hard skills are more accessible to obtain, meaning they can be quickly learned in the classroom. However, soft skills

take longer to acquire because it concerns the matter of personality. These two skills are integral elements of the capabilities to master ICT. However, because of the nature of hard skills that are easier to learn, the existing scientific studies to this day focused more to look at soft skills, which are relatively more complex, are often neglected, and are not a great concern in education (Muhmin, 2018). It has been widely agreed among scholars that soft skills determine the success of an employee. For instance, Neff and Citrin (1999) stated the key to an employee’s success is 90% soft skills and 10% hard skills.

According to Dahlman and Westphal (1981), technological mastery entails the capacity to proficiently utilize one’s knowledge of technology. Technological mastery can only be achieved through continuous technological endeavor, which itself is an integral element of the development of human capital in digital era. In order to achieve technological mastery, it is important to cultivate specific habits, including continuous study, experimentation, and the acquisition of a profound comprehension of the technology. The gap of technological mastery is defined as the disparity between the requisite skills and knowledge for proficiently utilizing technology and the existing skills and knowledge possessed by individuals or organizations. This gap can be mitigated through diverse methods, including implementing educational and training initiatives, engaging in self-directed learning, and cultivating specific behaviors.

This study aims to explore the importance of soft skills competencies in the workplaces, in the context of mastery of information technology, the internet, and computers in order to support and improve individual and organizational performance. As the benefits offered, this study provides empirical data on the importance of soft skills for vocational graduates (diploma 3 and 4) to possess the ability and work skills regarding the mastery of information technology, the internet, and computers so as to enhance work readiness in order to improve individual and organizational performance. Besides, this study also provides theoretical benefits concerning the strategies that need to be developed in order to increase the capability and competence of

vocational graduates to master technology and innovation in professional workplaces.

Based on that background, the research questions of this study are drawn as follows: i) how is the gap in the mastery of soft skills in terms of information technology, internet, and computer abilities among vocational graduates; ii) how important is the aspect of soft skills on the mastery of technology and innovation for vocational graduates to be able to enhance work readiness in order to improve individual and organizational performance; and iii) what is the role of educational institutions and the government in increasing the capability and competence of vocational graduates to master technology and innovation in professional workplaces.

II. ANALYTICAL FRAMEWORK

This research framework is concerned with the management of vocational human resources in the context of growth and mastery of industry-aligned technological advances. The quadruple helix model, a development of the triple helix that explains interactions in the knowledge economy, is used to explain it. Carayannis and Campbell (2016) proposed this model, which involves four actors as elements that collaborate as stakeholders, namely the government as a policy-making actor, industry, educational institute, and community. According to Arnkill, Järvensivu, Koski, and Piirainen (2010), this model was first used in Europe for projects funded by the European Union. They argue that the Quadruple Helix innovation model is a general definition of an innovation cooperation model or innovation environment in which users, companies, universities, and public authorities collaborate to produce innovations. This study employs four important actors as stakeholders who collaborate to implement the 2020 vocational education acceleration revitalization program.

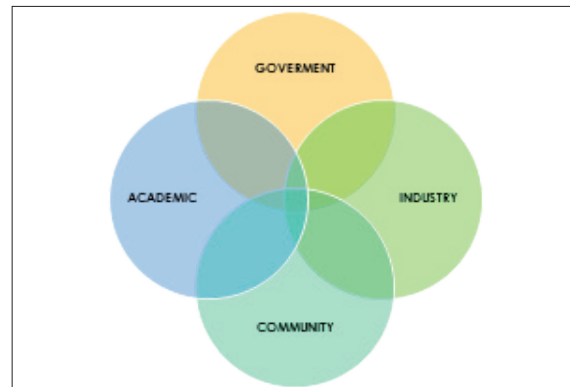


Figure 1. Research framework

To demonstrate cooperation in an innovative environment, this study used a framework in the form of a quadruple helix model (Figure 1). Shyafary, Pristanti, and Cahyadi (2020) investigated the implementation of these interaction models in vocational schools, particularly in Indonesia. The model implemented in Shyafary, Pristanti, and Cahyadi (2020) employs the penta helix model, which is reduced to the quadruple helix model in this paper because one of the model's components, mass media, is not investigated in this study. The government, academics, vocational higher education, industry, and vocational communities/alumni are all involved in this research as the main actors in efforts to form and develop vocational human resources. Individuals or communities, businesses, academics, and government all work together to create socially significant developments.

III. METHODOLOGY

This study employed a mixed methods to collect exhaustive data in order to answer research questions and achieve research objectives. This is in line with Creswell and Creswell (2013) and Neuman (2014), which stated that mixed methods is an all-encompassing approach that facilitates researchers to obtain more comprehensive and significant data.

This study combined quantitative and qualitative methods in order to obtain data that were exhaustive and saturated. First, an online survey in the form of questionnaire was conducted to the vocational program graduates with aim to collect information pertaining to i) the relevance between education major and field of work, in

relation to gender and employment status, and ii) the soft skills required in the professional workplaces. For three months (June–August 2023), several questionnaires were disseminated to the graduates of LPP Polytechnic (*Politeknik Lembaga Pendidikan Perkebunan*) spanning multiple generations. At the end of the survey, the data were collected from 175 LPP Polytechnic graduates who participated in completing and returning the questionnaires. Next, qualitative data were obtained through in-depth interviews conducted by the research team with working industry professionals, LPP Polytechnic graduates, educational institutions, and government policymakers focusing on vocational higher education programs.

This study involved three vocational higher education institutions, six enterprises and industries, ten graduates from LPP Polytechnic, and one vocational higher government institution. The quadruple helix model adopted in this study involved the graduates, educational institutions, the government, and industry. The research analysis used quantitative questionnaire to examine the differences among the vocational diploma graduates in terms of technological competence, internet skills, and computer proficiency .

All questionnaires were then analyzed using the paired sample t-test with JASP analysis to determine whether there are disparities in the competencies of vocational HR regarding the mastery of technology and innovation between

the time of their graduation and their employment. Following data coding, the qualitative data obtained through the in-depth interviews was then categorized and interpreted. In order to achieve the research objectives, every piece of data was triangulated. Neuman (2014) explained that data triangulation aims to validate all quantitative and qualitative data acquired in order to provide answers towards questions raised about the phenomenon. For that reason, as the final stage, this study employed data triangulation to compare all data findings to address research questions and achieve research objectives.

IV. RESULTS

Based on the findings of the online survey for three months to vocational graduates affiliated with LPP Polytechnic Yogyakarta, a total of 175 graduates hold diploma 3 and 4 vocational degree had participated. In order to enhance the accessibility and dissemination of research data, the career center of LPP Polytechnic Yogyakarta provided support for collecting the questionnaire data. The authors also cooperated with the Career Development Center (CDC) of LPP Polytechnic to access the data in the form of vocational graduates' responses to online questionnaires facilitated by the WhatsApp application communication technology and Google Docs groups.

The following information was derived from the demographic profile obtained through the online questionnaire:

Table 1. Description Profile of Vocational Graduates at Diploma Level

Variables	Details	N	Percentage	Sum
Gender	Male	94	54%	175
	Female	81	46%	175
Graduation year	2017	1	1%	175
	2019	4	2%	175
	2020	16	9%	175
	2021	67	38%	175
	2022	83	47%	175
	2023	4	2%	175
Have you found a job within 1– 6 months after graduating?	No.	25	17%	143
	Yes	118	83%	143
Are you currently working full time, not part time?	No.	36	21%	175
	Yes	139	79%	175
Is your current field of work in line with your education major?	No.	50	36%	139
	Yes	89	64%	139
Are your current job position in accordance with the diploma 3/diploma 4 education level?	No.	22	16%	139
What level of education is most appropriate/suitable for your current job position?	One level lower	10	7%	138
	One level higher	36	26%	138
	No Higher Education Required	5	4%	138
	Same level	87	63%	138
How relevant was your education major to your current job position?	Only a few of my education majors were relevant to my current job position (80–60%)	46	33%	139
	My education major was only slightly relevant to my current job position (< 40%)	30	22%	139
	My education major is very relevant to my current job (100%)	48	35%	139
	Not Relevant At All (0%)	15	11%	139
Are you currently or have you continued your education at a higher level, continuing diploma 4/ bachelor's/master's?	No.	125	90%	139
	Yes	14	10%	139

Source: Primary data processing, 2023

According to the results presented in Table 1, the total number of vocational graduate respondents from LPP Polytechnic were 175 individuals, of which 54% were male and 46% were female. The participants in this study came from different generations of graduate, namely from 2017 to 2023. The 2022 and 2021 graduates had the highest proportions of respondents (47 and 38%, respectively), while the 2017 graduates had the lowest, with only 1%.

Moreover, among the graduates of diploma 3 and diploma 4 program at LPP Polytechnic, 83% of them secured employment within six months or less to graduation. The remaining 17%

remained unemployed for longer than six months. Within six months of starting their works, the majority of LPP Polytechnic graduates who found employment before or after their graduation were distributed across various private, public, and BUMN positions. A significant proportion of diploma level vocational graduates (79%) have secured employment. The remaining 21% were either unemployed (maintaining a household), pursued further education, or have been actively seeking employment.

A total of 139 vocational graduates from LPP Polytechnic have successfully secured jobs. Among them, 64% have found employment

that relevant to their education major, while the remaining 36% have found employment that is not relevant to their academic discipline. Furthermore, concerning the alignment between job position and level of education, 84% of them stated that their current job position aligns to their level of education. However, 16% of them stated that their current job position does not align to their level of education. Next, regarding the most appropriate level of education for their current job position, 26% stated that a higher level of education is the most appropriate condition; 7% stated that a lower level of education is the most appropriate condition; 63% stated that education background that has the same level to their current job position is the most appropriate condition; and 4% believed that higher levels of education are unnecessary for their current job position.

The relevance between the education major and the fields of work of diploma vocational graduates revealed the following results: 35% of vocational graduates deemed the field of study they pursued during education to be completely relevant to their current fields of work; 33% of them assessed the relevance between their education major and their field of work to be between 60% and 80%; and 22% of them held the view that the relevance was less than 40%. Therefore, based on these results, it can be concluded that the majority of LPP Polytechnic diploma gradu-

ates have secured employment that is relevant to their education major, namely between 60 and 100% relevance.

Furthermore, it is noteworthy that a small proportion (10%) of employed LPP Polytechnic diploma graduates hold or currently pursuing advanced degrees ranging from diploma 4 to bachelor's degree and even master's degree. Conversely, 90% of vocational graduates did not pursue advanced degrees. This study provides evidence that over 79% of male and female of diploma vocational graduates are employed. Their field of work is consistent with and pertinent to their academic discipline, accounting for over 64%. Furthermore, their current job position is commensurate with their level of education, accounting for up to 84%. The private sector, government, and state-owned enterprises (BUMN) have recruited vocational graduates from LPP Polytechnic.

This study also aims to examine the extent to which diploma 3 and 4 vocational graduates have mastered information technology, internet skills, and computers. In order to answer that, a paired sample t-test analysis was performed using the JASP tool for statistical tests. Table 2 presents a concise summary of the findings.

All 175 respondents of vocational graduates from LPP Polytechnic have provided responses to all items on the queries concerning the abilities

Table 2. Statistical Mean, SD, SE and Coefficient of variation

Descriptions	N	Mean	SD	SE	Coefficient of variation
When you graduate, at what level will you master the following competencies? [Use of Information Technology]	175	4.697	0.974	0.074	0.207
At this time, at what level of the following competencies do you master? [Use of Information Technology]	175	4.691	1.010	0.076	0.215
When you graduate, at what level will you master the following competencies? [Knowledge Outside Your Field/Discipline]	175	4.509	0.999	0.076	0.222
At this time, at what level of the following competencies do you master? [Knowledge Outside Your Field/Discipline]	175	4.554	1.021	0.077	0.224
When you graduate, at what level will you master the following competencies? [Internet skills]	175	4.869	0.941	0.071	0.193
At this time, at what level of the following competencies do you master? [Internet skills]	175	4.840	0.969	0.073	0.200
When you graduate, at what level will you master the following competencies? [Computer skills]	175	4.800	0.941	0.071	0.196
At this time, at what level of the following competencies do you master? [Computer skills]	175	4.794	0.978	0.074	0.204

Source: primary data processing paired t-test

upon graduation and after employment regarding the competencies of technological mastery. The average score for post-graduation online proficiency varies from 4.5 for knowledge beyond the specific field of study to 4.8 for expertise in internet usage.

There is no significant difference between the vocational graduate's assessment of their mastery of information and technology competencies at the time of graduation and after employment, as shown by a p-value of 0.912 ($p > 0.05$). Regarding the competencies of knowledge outside their field/discipline at the time of graduation and after employment, there is no significant difference, as shown by a p-value of 0.373 ($p > 0.05$). Regarding the competencies of internet skills at the time of graduation and after employment, there is no significant difference, as shown by a p-value of 0.0524 ($p > 0.05$). Regarding the competencies of computer skills at the time of graduation and after employment, there is no significant difference, as shown by a p-value of 0.899 ($p > 0.05$). Thus, it can be concluded that based on the t-test results on the competencies regarding mastery of information technology, mastery in other fields, mastery of the internet, and mastery of computer development at the time of graduation and after employment, there is no significant difference in general. This suggests that for vocational graduates, whether upon graduation or after employment, there is no significant difference in terms of competencies, meaning the proficiencies built and

developed during education have been sufficient to support their work performances.

As for the question on how essential of soft skills aspect regarding the mastery of technology and innovation are for vocational graduates to be able to improve work readiness and individual and organizational performance, the results obtained from in-depth interviews with all actors reveal that in addition to the challenging aspects of competence that must be mastered, they also need additional soft skills to improve work readiness in order to increase individual and organizational productivity. In this regard, the main type of soft-skill that support performance and productivity is the ability and mastery of technological development, namely the ability to develop technology, the ability to use the internet and its applications, and the ability and mastery to develop and operate the ICT devices.

Soft skills related to competence and mastery of technological developments are highly necessary because of two reasons: i) global changes in the workplaces in all sectors, which have emphasized the needs and use of digitalization technology and ii) the trend of Industry 4.0. Furthermore, concerning this matter, Table 4 presents the interview results with several resource persons representing four main actors, namely industry, academics or educational institutions, government, and vocational graduates.

Tabel 3. Results of Paired Sample T-test

Measure 1	Measure 2	t	Df	p
When you graduate, at what level will you master the following competencies? [Use of Information Technology]	At this time, at what level of the following competencies do you master? [Use of Information Technology]	0.111	174	0.912
When you graduate, at what level will you master the following competencies? [Knowledge Outside Your Field/Discipline]	At this time, at what level of the following competencies do you master? [Knowledge Outside Your Field/Discipline]	-0.894	174	0.373
When you graduate, at what level will you master the following competencies? [Internet skills]	At this time, at what level of the following competencies do you master? [Internet skills]	0.639	174	0.524
When you graduate, at what level will you master the following competencies? [Computer skills]	At this time, at what level of the following competencies do you master? [Computer skills]	0.128	174	0.899

Note. Student's t-test.

Source: primary data processing paired sample t-test

Table 4. Statements Regarding the Importance of Ability and Mastery of the Development of Information Technology, the Internet, and Computers

Actor	Statement			Note
	Mastery of technological developments	Internet mastery	Mastery of the development and use of computers	
Industry	We need staff at the diploma level to have the ability to develop technology applications, such as building real data systems.	Vocational HR require ability and mastery of technology, especially internet access.	We need to master applications and computerization.	Ability and mastery of the development of information technology, the internet, and computers is one of the essential soft skill criteria for vocational HR.
	Industry needs people who, apart from having hard competencies, also master soft skills, such as mastery of technological developments.	With the development of the internet, we really need vocational HR who are able to help us optimize it.	In fact, we also hold competitions between units to build digital applications in order to improve our performance	
	Technological developments need to be mastered in order to improve the quality and quantity of work.		Mastery of performance skills in the field of computer technology is very important even when working in the estate	
	Technological developments also provide added value for vocational human resources.	We always need to report actual data and we need to optimize it through the help of internet developments.	The development of computer technology needs to be studied and mastered in order to report real data.	
	Mastery and ability to master technology are now a must for human resources, especially vocational ones, to increase their competitiveness compared to undergraduate level human resources.		Estate worker now really need to be able to master developments in computer technology to improve their performance and to be ready if at any time they are asked for real time data by central superiors.	
Government	Mastery of technology and developments at diploma 3 and 4 degree is a soft skill that is needed in the workplaces.	Internet development opportunities can be used to help facilitate access to information and communication for vocational education institutions, students, and industries.	Technological ability cannot be separated from their ability to master, operate, and use the advances in computerization to improve their performance	Educational institutions need to manage vocational human resources to be able to master technology and its development as additional skills so that they can add value and increase their competitiveness in domestic and global job market.
	Mastery and ability to develop technology aims to increase added value so that they can be competitive.	It is necessary to master skills in internet technology to increase the competitiveness of vocational graduate.	Mastery and utilization of computer technology are necessary to increase individual and organizational productivity.	

Actor	Statement			
	Mastery of technological developments	Internet mastery	Mastery of the development and use of computers	Note
Educational institutions	We have included courses related to data management, but have not specifically provided skills and training in technological development.	We have included some of these abilities in lecture activities, although not all of them do require an effective strategy to improve the ability to use the internet.	The strategy of the curriculum cannot be separated from improving skills and mastery of computer technology and applications that prepare them for work in the future.	Educational institutions have made every effort to improve the soft skills of vocational HR, but they have admitted for not being able to optimally improve skills in mastering technological developments.
	We encouraged students to take part in various other activities outside campus that are related to technology.		We have encouraged several students to take part in competitions at the national level for the development of computer technology.	
Diploma 3 and 4 Vocational Graduate	We need abilities and skills to master technological developments.	The development of the internet really supports performance, thus companies encourage us to be able to master it.	We really need the ability and mastery in computers technology, especially to develop applications.	Vocational graduate require the ability and mastery of technological developments to be able to increase competitiveness by having added value that differentiates them from general academic graduates so that they are more confident in working.
	Technological developments are needed in the workplaces, even when working in estates.	When using a cellular phone in the field to report real time data to superiors through the help of the internet, it is very helpful.	We need skills in operating technology, such as Excel, in order to process data and commands from superiors .	
	Mastery of technology really helps me to work productively, especially to provide real data.	The ability and mastery of internet technology is an added value for us when applying for jobs, because we make better use of it.	I need to be able to master this technology and receive regular training from the company.	

Source: Primary research data processing

Based on the statements in Table 4, it is possible to demonstrate the critical nature of the requirement for vocational graduates to possess technological expertise and proficiency to enhance their work readiness and performance in the workplace. The capabilities of mastering technological development are required in tandem with the demands of the industry, which necessitates these capabilities to increase industrial productivity and performance. The anticipated outcome of individuals who have completed vocational education at diploma 3 and 4 level is to be competitive by possessing the knowledge and skills necessary to master technological advancements in the workplace. This competence will increase their added value and capacity, not

only as executors, but also as prospects for future career advancement.

It is widely acknowledged within the industry that proficiency and knowledge of technological advancements are indispensable to elevate individuals' performance in order to enhance organizations' productivity. Almost all business sectors require the employee candidates to possess diploma-level competence on this matter. For instances, companies and industries operating in the plantation sector across various divisions typically expect their employees to possess the knowledge and proficiency to use technological advancements. In practice, proficiency and command of technological advancements in experimental and production plantations are essential for generating digital maps and coordinate

points depicting the precise locations of every plant unit, including its type and individual position within the plantation area. These skills significantly improve the monitoring quality of the plantation's location, status, circumstance, and state in real-time. Besides, it is also widely acknowledged that proficiency and command of technology are highly advantageous, as they allow the organization members to complete their tasks in a more effective and timely manner.

The government recognized the necessity for educational institutions to effectively provide vocational human resources with necessary soft skills competence as the added value to enhance their competitiveness, both in domestic and global job market. The government's regulations pertaining to the development of vocational human resources, from vocational schools to vocational universities, were realized through the enactment of the 8+i link and super match package program (Ministry of Education, Culture, Research, and Technology, 2021). It is anticipated that this program will promote comprehensive collaboration between industry and academic institutions in order to provide vocational human resources with valuable opportunities to enhance their skills. Vocational students require direct experience in real industry, which can be obtained not only through educational activities, but also through internship program.

As stated by (Disas, 2018) the Director General of Vocational Higher Education, the 8+i program aims to cultivate the necessary capabilities and interpersonal proficiencies for the vocational workforces so that they can be more competent in the business and industrial sector. In order to bridge the gap between the industry's adaptable skill requirements and the available vocational workforces, it is imperative to conduct project-based learning opportunities that facilitate vocational students to engage in authentic experiences and generate tangible outcomes. The project-based learning aims to give students opportunities and experience to manage their projects in a practical setting while also establishing measurable objectives that can be accomplished independently or through the assistance of academic or lecture intervention. Academics play a role to provide mentoring or

coaching, knowledge transfer, and experience in a manner that deviates from the conventional definition of education. The objective is to shift the mindset of academics towards cooperation, namely facilitates vocational students to directly engage in project management in order to acquire valuable information and experience in the process.

Educational institutions have strived to improve the soft skills of vocational human resources, but it is revealed that they have yet to be able to optimally improve their students' skills in mastering technological developments. Educational institutions have tried to sit together with the industry to discuss the existing conditions of vocational human resources and the necessary competencies need to be built and developed by vocational human resources. For quite a while, learning strategies and curricula in vocational institutions have been required to be adjusted in order to achieve the target of creating vocational human resources that are easily absorbed by the labor market due to their competencies' relevance with industrial needs. Nonetheless, it is still difficult for vocational institutions to adjust their curriculum and education levels to meet that needs.

Moreover, the 8+i link and super match package program aims to improve the quality of vocational human resources by upgrading the diploma 3 level to diploma 4 level to bridge the gap in skills and education levels. It is expected that through this upgrade, vocational human resources will be more well-equipped in terms of hard skills and soft-skills mastery so that they can be more competent in the workplaces. The internship duration has been modified to provide vocational students with two internships lasting six months each, spread across two semesters. Additionally, students are now permitted to engage in an independent learning internship through the MBKM Program. The purpose of changing the internship time and lengthening it is to provide a more extended opportunity for students to focus and master the stages and processes of working directly in their fields. By taking the internship, it is expected that students can directly learn the work process and enter the project to build soft skills with the guidance of field supervisors from

the industry. In addition, this will offset the difficulties of educational institutions in changing the mindset of their academics to explore and collaborate with industrial actors in providing opportunities for their students to participate in real project-based learning.

The interview results reveal that vocational graduates are required to possess the ability and mastery of technological developments in order to increase competitiveness. The goal is to have added value that can distinguish them from other types of academic graduates so that they are more confident to enter the workplaces. Besides, the vocational institutions nowadays have the duty to equip their students with the ability and mastery of soft skills aspect, as this competence will support their work readiness, as well as individual and organizational performance. Besides, soft skills aspect is an essential element of the technological mastery. Thereby, it is required to be integrated in various hard skills, such as developing computer applications, optimizing internet usage, and taking advantage of the advancements in ICT domains in order to achieve organizational targets.

In reality, vocational graduates who have been employed are expected to be able to dynamically adjust and adapt themselves to the changes and requests from the industry. The vocational graduates who work on the farm and in the office are equally demanded to be more technology-savvy. The actors have the same view on the importance of the ability and mastery of technological developments to meet industrial needs. Soft skills aspect in technological mastery is an added value that is highly advantageous for vocational human resources to compete in domestic and global job market. Efforts so far to master technology are not only performed in college, but also based more on the students' interests to explore and take advantage of opportunities when doing internships and project-based learning to develop these abilities. In reality, developing the ability to master technology is necessary because of changes in the industrial world towards Industry 4.0.

Furthermore, an examination of the study's findings provides insight into the involvement of

governmental bodies and educational institutions in enhancing the proficiency and capability of diploma 3 and 4 vocational human resources in mastering technology and innovation. However, the strategies designed and implemented by educational institutions to elevate the capabilities and competitiveness of the vocational human resources are still considered incompatible to meet the expectation. According to the Director General of Vocational Higher Education, the implementation of regulations about the 8+i program is impeded by the disparity between vocational higher education institutions and government programs. The deficiency is rooted in the comprehension and execution of the 8+I program, which seeks to enhance the competitiveness and soft skills of vocational human resources. On the other hand, vocational academic curriculum apparently has not been oriented towards the mastery of soft skills required in real business and industrial sector. Therefore, the implementation of the curriculum still need to be more optimally oriented towards real work practices and project-based learning in order to generate the workforce-ready human resources who are equipped with industry-relevant soft skills.

The deficiency pertains to the manner, in which vocational higher education institutions execute educational management initiatives that foster a unified and cooperative comprehension among academia, curriculum, and industry. This understanding is crucial for these institutions to facilitate the provision of practical experience and employment prospects for vocational students. The purpose of the 8+i link and super match program is to equip students with practical experience so that they are capable of executing the real work practices in order to achieve predetermined objectives, thus directly enhancing their competencies. In this regard, academics or lecturers serve as mentors who offer guidance and direction to students, in addition to facilitating project management opportunities.

As a result, the vocational program places significant emphasis on project-based learning to provide students with the chance to oversee projects and gain practical experience in completing a task in order to achieve the predetermined objectives. The purpose of these activities is to

provide students with opportunities and real-world experience in managing and handling a project and achieving objectives so that they may benefit from them. Instead of traditional instructors, academics or lecturers serve as mentors. Therefore, by completing the project, they can gain valuable experience as a part of acquiring the expertise. The academic proficiency tends to be lack of capability in undertaking projects immediately, gaining practical experience on projects, and accomplishing project objectives. These are challenge that many individuals face within academic establishments. Overall, scholars continue to possess limited practical knowledge and expertise in management and project management, which hinder their ability to meet the industrial demands. Academic experience-based capacity and aptitude remain the only limitations at this regard. This is in direct opposition to the objective of developing the soft skill competencies that necessary for vocational human resources.

V. DISCUSSION

This study adopted a research framework in the form of quadruple helix model that comprises four primary elements: government, academics, vocational higher education, industry, and vocational communities/alumni.

• Academic and Industry

Based on the results of this study, a significant proportion (over 79%) of LPP Polytechnic's diploma 3 and 4 graduates were employed prior to or within six months of their graduation. It is concluded that the capacity and proficiency to comprehend technological advancements did not differ between the time of their graduation and the time after they have been employed. Based on the statistical data, the relevance between their field of work and their education major exceeds 68%, namely ranging from 60% to 100%. This reveals that LPP Polytechnic as an academic institution has actively strived to develop their students' soft skills and computer literacy, including the mastery of technological advancements concerning the optimization of internet usage and computerization. They have endeavored to acquire knowledge and expertise

in various disciplines that supplement the work-related proficiencies required for employment. Possessing expertise in additional domains that can positively impact both individual and organizational performance is an essential asset for all professional human resources, regardless of their educational background.

Hence, it is crucial to foster a resurgence of collaboration between educational institutions and industry, creating a tangible environment for them to engage in reciprocal interaction.

• Academic and Government

Curriculum revitalization must be designed to be more flexibly, more comprehensive, and more pertinent to industrial needs as a link and match concept. The revitalization of educators and education personnel aims to improve teachers' competence through dual expertise programs in order to meet the needs of productive teachers.

Based on the Instruction of the President of the Republic of Indonesia No. 9 of 2016 on the Revitalization of Vocational Education, there are four important points concerning this matter, namely curriculum revitalization, education and education personnel, cooperation, and graduates. In addition, Article 16 Paragraph 2 of Law No. 12 of 2012 concerning Higher Education also stated that vocational education can be further developed by the government in the form of an applied master's program or an applied doctoral program. The existence of the higher levels of vocational education (diploma 2, 3, and 4) is intended to be able to respond to the workforces needs of the workplaces and business.

• Academic and Individuals or Communities

The occurrence of disparity, which refers to the incompatibility between education and employment, has been identified as a labor issue in Indonesia (World Bank, 2020). Several criteria can be used to classify the incongruity between education and employment in the labor market: economic skills, credentialism, overqualification, underqualification, overskilling, and

underskilling, as well as vertical and horizontal mismatches (Tentua & Winarko, 2020).

In terms of hard skills, the industry has recognized the superiority of diploma 3 and 4 vocational human resources as the professional people who excel in handling direct work practices. Nonetheless, the development of soft skills still needs to be improved in order to increase their capabilities. This pursuit of development is needed to further enhance their potential and skills so that they become quality talents that are highly sought by the industry and to be easier in being promoted to higher positions in workplaces. Through soft skills development, it is expected that the vocational human resources are able to bring added value, better prepared to work, and more competitive.

In general, vocational higher education aims to produce human resources who can master the ability in certain fields of work so that they can be directly absorbed as workforces in industry, government, or entrepreneurship independently. The core of teaching in vocational higher education programs prioritizes skills and expertise over theory with a ratio of 70:30.

• **Industry and Government**

Various policies that support the use of vocational labor also support its provision. For instance, the Ministry of Education, Culture, Research, and Technology has enacted a program known as link and super match program aiming to promote the alignment between vocational human resources' competencies and industrial needs (Ministry of Education, Culture, Research, and Technology, 2021).

One of the most beneficial regulations for industries in using vocational human resources is the Super Tax Deduction policy through the enactment of the Regulation of the Minister of Finance No. 128 of 2019, which provides incentives in the form of tax cuts of up to 200% to industries that support vocational development through work practices, apprenticeships, and learning programs (Ministry of Education, Culture, Research, and Technology, 2020).

• **Industry and Individuals or Communities**

The fast growth of technology, especially in the field of ICT and ICT technology, has led to an increasing requirement for HR professionals to possess the requisite knowledge in this area. The technology industry demonstrates its high demand with a year-on-year Combined Annual Growth Rate (CAGR) of 26% between 2017 and 2022. (Manner, 2023). Furthermore, the utilization rate of hardware devices based on ICT is also steadily rising. According to a prediction made by Andrae and Edler in 2015, ICT devices are expected to account for 20% of the global electricity consumption by the year 2030. The mastery of ICT will become the key essential skill for people in firms as a result of all these factors.

Furthermore, with the continuous development of the business and industrial sectors, there is a high demand for HR professionals that possess exceptional skills that go beyond the basic qualifications. Lee and Wie (2013) state that Indonesian firms are shifting towards a greater emphasis on exporting and prioritizing customer needs. This shift requires the recruitment of professionals who possess essential soft skills, including relationship management, communication, and leadership. According to employment proprietors, sectors such as industry, government, and BUMN require human resources with value exceeding their competencies in order to remain competitive. Employees who possess valuable soft skills can encourage good cooperation among all elements in the organization in order to achieve great performance together. This brings favorable effect, as it allows organizations to maximize the use of their employees for rapid promotion to higher positions. Besides, having valuable soft skills will be advantageous for the employees to create a conducive atmosphere, to be able to adapt themselves to the work environment, and to build a more supportive work climate to facilitate knowledge sharing, which in turns will promote business competitiveness (Romadona, 2017).

- **Government and Individuals or Communities**

Professional HR who possess the necessary knowledge and skills to master technological advancements will enhance their competitiveness, both in domestic and global job market. The paramount elements of human capital investment are education and training (Becker, 1994). If a diploma is the proof of education, then a certificate is the proof of training. Certification is very important, especially to elevate the capacity and capability of human resources so that they can acquire the necessary knowledge and skills that are relevant to the current needs of business and industrial sector (Ministry of Education and Culture, Republik Indonesia, 2020). For that reason, certification of ICT skills is highly important considering its massive development in almost every business sector.

Based on the Survey of Adult Skills (PIAAC) conducted by the OECD, Chung and Elliott (2015) concluded that the majority of adults nowadays only possess rudimentary ICT abilities. This restricts their capabilities to basic duties, preventing them from assessing and resolving issues in the “technologically rich environment” prevalent in contemporary work environments that heavily depend on ICT. Because virtually all employment markets require this competence, computer/ICT courses are in high demand in this digital era (Ministry of Education, Culture, Research, and Technology, 2021). In addition, Schweri et al. (2020) discovered that contrary to popular belief, skills acquired in vocational education is more transferable than is commonly believed, and that workers can perpetually update their skill sets through continuous training and on-the-job learning.

Referring to the findings of this study, there is agreement among the resource persons in the quadruple helix model that the ability and mastery of technological developments will add value and increase the work readiness of vocational human resources. Elstad (2016) also stated that the ability to use ICT has a strong connection to the familiarity and mastery of the technology. In this regard, vocational human resources from diploma 3 and 4 degree will compete in real terms

with academic human resources from bachelor’s degree, thus it poses as a challenge for them to prove their competence in the job market.

VI. CONCLUSION

The findings of this study show no significant difference between the abilities of the vocational graduate at the time of their graduation and the abilities after they have been employed in terms of the mastery of technological developments. This means the majority of vocational graduates were able to equip themselves with soft-skills aspect in order to increase their competitiveness in the workplaces through the mastery of technological development. This is useful for increasing the work readiness of vocational human resources so that they can elevate their competitiveness to get better job opportunities and to be more competitive with undergraduate students. This study also found that the majority of LPP Polytechnic graduates have acquired the added value through the mastery of technological developments. Many vocational graduates have worked in the fields that are relevant to their education major.

The ability and mastery of technological developments in terms of optimizing internet facilities and developing computer applications have proven to improve the performance of both vocational graduates and organization. Besides, the ability and mastery of technological developments are not limited to vocational graduates who work in the upkeep or head office; these skills are also necessary in all lines of work, including for them who are placed on the plantation. The government, through the Directorate of Partnership and Alignment of Business and Industry, the Directorate General of Vocational Education, and Ministry of Education and Culture of the Republic of Indonesia, has provided regulations for vocational development in the form of 8+I link and super match program for educational institutions and industry, as well as the provision of a super deduction tax for industry.

Nonetheless, the scope of this study is still restricted on vocational graduates from LPP Polytechnic.

Therefore, as a suggestion, future studies can expand the research scope, such as by examining

various vocational graduates from other vocational institutions, also increasing the number of respondents with more diverse range of educational backgrounds. In addition, in order to generate more comprehensive empirical evidences, future studies can examine the other factors and aspects that influence soft-skills competence in technological mastery. This topic can be explored using both quantitative and qualitative approach, or using mixed methods, as this study has been done so that it will enrich the literature of this domain.

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REFERENCES

- Anderson, R. E. (2008). Implications of the Information and Knowledge Society for Education. In G. K. Joke Voogt, *International Handbook of Information Technology in Primary and Secondary Education* (pp. 5-22). Springer.
- Andrae, A. S., & Edler, T. (2015). On Global Electricity Usage of Communication Technology: Trends to 2030. *Challenges*, 6, 117-157. doi:10.3390/challe6010117
- Arnkil, R., Järvensivu, A., Koski, P., & Piirainen, T. (2010). *Exploring Quadruple Helix, Outlining user-oriented innovation models*. University of Tampere.
- Avis, J. (2018). Socio-technical imaginary of the fourth industrial revolution and its implications for vocational education and training: a literature review. *Journal of Vocational Education & Training*, 70(3), 337-363. doi:10.1080/13636820.2018.1498907
- Becker, G. S. (1994). Human Capital Revisited. In G. S. Becker, *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. The University of Chicago Press.
- Bolaños, F., & Pilerot, O. (2023). Where are digital abilities within Chile's State technical formation centres? A discourse analysis of public policy. *Journal of Vocational Education & Training*. doi:10.1080/13636820.2022.2161407
- Brown, J. S., & Duguid, P. (2017). *The Social Life of Information*. Harvard Business Review Press.
- Carayannis, E. G., & Campbell, D. F. (2016). *Knowledge Creation, Diffusion, and Use in Innovation Networks and Knowledge Clusters*. Preager.
- Central Bureau of Statistics. (2023). *Concept/Technical Explanation*. Retrieved December 2023, from Central Bureau of Statistics: <https://acehtimurkab.bps.go.id/subject/6/tenaga-kerja.html#:~:text=Penduduk%20usia%20kerja%20adalah%20penduduk,sementara%20tidak%20bekerja%20dan%20pengangguran>.
- Chung, J. E., & Elliott, S. (2015). *Adults, Computers and Problem Solving: What's the Problem?* OECD Publishing.
- Creswell, J. W., & Creswell, J. D. (2013). *Research Design: qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.
- Dahlman, C. J., & Westphal, L. E. (1981). The meaning of technological mastery in relation to transfer of technology. *The Annals of the American Academy of Political and Social Science*, , 458(1), 12-26.
- Disas, E. P. (2018). Link and match as a vocational education policy. *Jurnal Penelitian Pendidikan*, 18(2), 231-242.
- Elstad, E. (2016). Educational Technology; Expectations and Experiences: An Introductory Overview. In E. Elstad, *Digital Expectations and Experiences in Education* (pp. 3-28). Springer.
- Hunt, S. T. (2007). *Hiring Success: The Art and Science of Staffing Assessment and Employee Selection*. John Willey & Sons.
- Lee, J.-W., & Wie, D. (2013). *Technological Change, Skill Demand, and Wage Inequality in Indonesia*. Asean Development Bank.
- Manner, J. (2023). Black software — the energy unsustainability of software systems in the 21st century. *Oxford Open Energy*, 1-8. doi:10.1093/ooenergy/oiac011
- Ministry of Education and Culture, Republik Indonesia. (2020). *Pocket Book: Vocational Partner Super Tax Deduction*. Retrieved 11 2023, from Pocket Book: Vocational Partner Super Tax Deduction: <https://magang-sas.telkomuniversity.ac.id/wp-content/uploads/2021/04/Buku-Saku-Super-Tax-Deduction-untuk-Mitra-Vokasi.pdf>

- Ministry of Education and Culture, Republik Indonesia. (2020). *Kemendikbud*. Retrieved 11 2023, from Kemendikbud: <https://www.kemdikbud.go.id/main/blog/2020/07/kemdikbud-luncurkan-program-sertifikasi-kompetensi-dan-profesi-bagi-sdm-vokasi>
- Ministry of Education, Culture, Research, and Technology. (2021). *Vocational Education Profile in 2021 Based on Dapodik, Susenas and Sakernas*. Ministry Of Education, Culture, Research and Technology and Central Bureau Of Statistics, Directorate General of Vocational Education. Jakarta: Ministry of Education, Culture, Research, and Technology.
- Muhmin, A. H. (2018). The Importance of Developing Student Soft Skills in Higher Education. *Esa Unggul University Scientific Forum*, 15(2), 330-338.
- Neff, T. J., & Citrin, J. M. (1999). *Lessons from the Top: In Search of America's Best Business Leaders*. Crown Business.
- Neuman, W. L. (2014). *Social Research Methods: Qualitative and Quantitative Approaches*. Pearson.
- Pichler, D., & Stehrer, R. (2021). *Breaking Through the Digital Ceiling: ICT Skills and Labour Market Opportunities*. Wiener Institut für Internationale Wirtschaftsvergleiche.
- President of Republic Indonesia. (2016). *Copy of Presidential Instruction Number 9 of 2016*. Retrieved 10 9, 2023, from Ministry of Education and Culture: <https://www.kemdikbud.go.id/main/index.php/files/download/e451d9ec3a04121>
- Rainsbury, E., Hodges, D., Burchell, N., & Lay, M. (2002). *Ranking Workplace Competencies: Student and Graduate Perceptions*. Asia-Pacific Journal of Cooperative Education.
- Romadona, M. R. (2017). The Role of Self-efficacy and Communication Skills of Researchers to Organizational Climate at Research Center X. *Jurnal Pekommas*, 2(1), 55-64. doi:10.30818/jpkm.2017.2020106
- Schwab, K., & Zahidi, S. (2020). *The Global Competitiveness Report, Special Edition 2020: How Countries are Performing on the Road to Recovery*. Global economic Forum.
- Schweri, J., Eymann, A., & Aepli, M. (2020). Horizontal Mismatch and Vocational Education. *Applied Economics*, 52(32), 3464-3478. doi: 10.1080/00036846.2020.1713292
- Setiawan, S., & Poerbosisworo, I. R. (2022). Barriers To Implementation of Industry 4.0 in Indonesia: Case of The Textile and Automotive Industries. *Pekommas*, 7(2), 161-172.
- Shyafary, D., Pristanti, H., & Cahyadi, D. (2020). Implementation of the Role of Higher Education in the Vocational Sector in the Penta Helix Mode. *2nd Borobudur International Symposium on Humanities and Social Sciences, BIS-HSS 2020*.
- Spencer, L. M., & Spencer, S. M. (1993). *Competence at Work: Models for Superior Performance*. Wiley.
- Tentua, M. N., & Winarko, E. (2020). Applying Data Mining to Analysis of Mismatch Between Education and Labor Market in Indonesia. *IOP Conference Series: Materials Science and Engineering*. doi:10.1088/1757-899X/771/1/012020
- United Nations. (2023). *How UN supports SDGs in Indonesia*. Retrieved 10 9, 2023, from United Nations: <https://indonesia.un.org/id/sdgs>
- World Bank. (2020). *List of Critical Jobs in Indonesia 2018; Technical Report*. World Bank.
- Zulfiyandi, Wirawan, F. A., Tanjung, N. P., Yolanda, R., Zaini, M., Andrian, D., . . . Sidantha, I. N. (2021). *Employment in 2021 Edition 4 Data*. Center for Employment Data and Information Technology.